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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,512	02/26/2004	Ke Liu	C-2836B	7736
7590 01/10/2005			EXAMINER	
M. P. Williams 210 Main Street Manchester, CT 06040			NGUYEN, TU MINH	
			ART UNIT	PAPER NUMBER
			3748	

DATE MAILED: 01/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/789,512

Applicant(s)

LIU, KE

Examiner

Tu M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-14, 17 and 18 is/are rejected.
- 7) ☒ Claim(s) 5-7, 15 and 16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 042204.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. An Applicant's Preliminary Remarks and an Applicant's Declaration Under 37 CFR 1.132 filed on March 31, 2004 have been entered. Overall, claims 1-18 are pending in this application.

#### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1 and 8-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Bromberg et al. (U.S. Patent 6,560,958).

Re claims 1 and 10, as shown in Figure 1, Bromberg et al. disclose a system using reformat for reducing oxides of nitrogen (NO<sub>x</sub>) in the exhaust of a hydrocarbon-fueled, internal combustion engine (26) which operates with fuel from a source and air from an air inlet and which provides engine exhaust in an exhaust pipe (28), comprising:

- reformat means (12) having an inlet and an outlet for providing at the outlet a flow of the reformat including at least hydrogen, the means comprising a homogeneous non-catalytic

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partial oxidizer (12) receiving at an inlet of the partial oxidizer fuel (18) from the source and unhumidified air (16) from the air inlet; and

- NOx reducing means (32) receiving the engine exhaust and the reformat for reducing the NOx in the engine exhaust to provide system exhaust with diminished NOx.

Re claim 8, as shown in Figure 4, the NOx reducing means in the system of Bromberg et al. comprises at least one NOx trap (32 or 42), each NOx trap alternately trapping NOx in the exhaust and being regenerated by the outflow of reformat.

Re claim 9, in the system of Bromberg et al., the NOx reducing means comprises an NOx reducing catalytic converter (lines 53-65 of column 4).

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bromberg et al. as applied to claim 1 above, in view of design choice.

The system of Bromberg et al. discloses the invention as cited above, however, fails to disclose that the outputs of the reducing means comprise no more than about 0.4 grams/bhp/hr NOx and no more than about 0.28 grams/bhp/hr of non-methane hydrocarbons.

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With regard to applicant's claim directed to the specified amounts of NO<sub>x</sub> and non-methane hydrocarbons released from the NO<sub>x</sub> reducing means, the application of such would have been an obvious matter of design choice well within the level of ordinary skill in the art depending mostly on a legal requirement such as an EPA requirement. Moreover, there is nothing in the record which establishes that the application of such presents a novel of unexpected result (See *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)).

6. Claims 1, 4, 8-14, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bromberg et al. in view of Komatsu (U.S. Patent 6,318,306).

Re claims 1, 11, and 12, as illustrated in Figure 1, Bromberg et al. disclose a system using reformat, an apparatus, and a method for reducing oxides of nitrogen (NO<sub>x</sub>) in the exhaust of a hydrocarbon-fueled, internal combustion engine (26) which operates with fuel from a source and air from an air inlet and which provides engine exhaust in an exhaust pipe (28), the system comprising:

- reformat means (12) having an inlet and an outlet for providing at the outlet, a flow of the reformat including at least hydrogen, the means comprising a hydrogen generator (12), the hydrogen generator receiving, at an inlet of the generator, a mixture comprising air (16) from the air inlet, fuel (18) from the source, and water (20); and

- NO<sub>x</sub> reducing means (32) receiving the engine exhaust and the reformat for reducing the NO<sub>x</sub> in the engine exhaust to provide system exhaust with diminished NO<sub>x</sub>.

Bromberg et al., however, fail to disclose that the reformat means further comprises a water tank so that the air is humidified with moisture from the water tank.

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As shown in Figure 1, Komatsu teaches that it is conventional in the art to utilize a reforming system comprising an integral fuel and steam reformer (8) receiving a mixture of air humidified with moisture from a water tank (11) and fuel from a source (9). This reforming system generates a reformat gas enriched with hydrogen and carbon monoxide. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the water tank taught by Komatsu in the system, apparatus, and method of Bromberg et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to produce a hydrogen enriched reformat gas.

Re claim 10, in the modified system of Bromberg et al., the hydrogen generator is selected from a catalytic partial oxidizer (22).

Re claims 4, 13, and 14, in the modified system and method of Bromberg et al., the system further comprises a heat exchanger ((7) in Komatsu) for vaporizing engine fuel by heat exchange with the exhaust before the fuel is added into the mixture.

Re claims 9 and 17, in the modified system and method of Bromberg et al., the NO<sub>x</sub> reducing means comprises an NO<sub>x</sub> reducing catalytic converter (lines 53-65 of column 4) which the exhaust and the reformat flow are applied contemporaneously.

Re claims 8 and 18, as shown in Figure 4, the NO<sub>x</sub> reducing means in the modified system and method of Bromberg et al. comprises at least one NO<sub>x</sub> trap (32 or 42), each NO<sub>x</sub> trap alternately trapping NO<sub>x</sub> in the exhaust and being regenerated by the outflow of reformat.

7. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bromberg et al. in view of Komatsu as applied to claim 1 above, and further in view of design choice.

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The modified system of Bromberg et al. discloses the invention as cited above, however, fails to disclose that the outputs of the reducing means comprise no more than about 0.4 grams/bhp/hr NO<sub>x</sub> and no more than about 0.28 grams/bhp/hr of non-methane hydrocarbons.

With regard to applicant's claim directed to the specified amounts of NO<sub>x</sub> and non-methane hydrocarbons released from the NO<sub>x</sub> reducing means, the application of such would have been an obvious matter of design choice well within the level of ordinary skill in the art depending mostly on a legal requirement such as an EPA requirement. Moreover, there is nothing in the record which establishes that the application of such presents a novel of unexpected result (See *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)).

#### ***Allowable Subject Matter***

8. Claims 5-7, 15, and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

9. Applicant's arguments with respect to Boegner et al. and Komatsu have been fully considered but are moot in view of the new ground(s) of rejection.

#### ***Prior Art***

10. The IDS (PTO-1449) filed on April 22, 2004 has been considered. An initialized copy is attached hereto.

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11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of two patents: Smalling (U.S. Patent 6,758,035) and Kupe et al. (U.S. Patent 6,832,473) further disclose a state of the art.

*Communication*

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Tu M. Nguyen*

TMN

January 6, 2005

Tu M. Nguyen

Primary Examiner

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